

Researchers Want to Add Touch, Taste and Smell to Virtual Reality

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Wired

04.03.2009

Virtual reality schemes have long tantalized geeks with unrealized visions of holodecks and long-distance cybersex.

Now, a group of British researchers want to round out the experience with virtual touch, taste and smell. To simulate the real world, they argue, all five of your senses must be stimulated. Toward that end, they've mocked up a "Virtual Cocoon" with a separate glove that — at least in theory — could tickle your tongue as it, uh, nukes your nose.

To differentiate themselves from virtual reality schemes that have come and gone, the researchers are re-branding their effort as "real virtuality."

"The crucial thing for 'real virtuality' is that it will hit all five senses in a highly realistic manner," said Alan Chalmers, a professor at the University of Warwick Digital Lab. "You can't ignore the crossmodal effect. We need to have smell, we need to have taste."

Virtual reality has been long on promise and short on delivery for more than two decades. Way back in the second issue of Wired magazine in 1993, we delivered a massive story on Jaron Lanier's virtual reality dreams. Though computing power has continued its exponential rise over the last 16 years, virtual reality feels little more "real" than it once did. Certainly, no one would mistake Second Life for real life or a virtual reality "CAVE" used in oil exploration for the geological formations themselves. Even with

huge improvements in graphics, virtual reality has remained more virtual than real.

Chalmers and his collaborator, David Howard, head of the Audio Laboratory at the University of York, could be onto something with their multi-sensory approach, even if it is a daunting task. What gives them hope is that the simulations of every sense don't need to be perfect, they just need to work — and work well together.

Drawing on cognitive neuroscience literature about how the brain prioritizes sensory inputs, they can deliver the right level of detail with maximum engineering efficiency. Cognitive neuroscientists call these crossmodal attention affects.

For example, when you pay close attention to one thing — say someone's voice on the telephone — you pay less attention to your peripheral vision. Using that information could allow the researchers to build a VR system that functions with far less brute force than you might think was necessary — stimulating one or two senses at a time, rather than all of them at once. Howard compared it to the way the JPG format compresses image files.

"The amount of brain power given to sight, once sound, smell and touch are introduced, reduces dramatically. For instance, when you are driving around looking for a road sign you will probably turn down the volume on your car stereo," Chalmers explains on his website. "This is because you need more brain power diverted to the sight sense. This means that, with other stimuli introduced to a virtual environment, we could reduce still further the amount of rendering needed."

Or so they think. Right now, all the researchers have are a mockup and a research plan, plus enough funding from the U.K.'s Engineering and Physical Science Research Council to get started.

Chalmers said it would take "on the order of millions of pounds" to deliver a working prototype in "three to five years."

They will face some daunting technological challenges, said Jane Mulligan, a virtual reality researcher at the University of Colorado at Boulder.

"Visually, we'd say that our most advanced technology is the virtual worlds of games," Mulligan said. "But even those, it's difficult to make them compelling and like you're really there."

She pointed to haptics, the sense of physical presence, as the key stumbling block.

"Your sense of touch is extremely precise," she said. "Most people that I've talked to, people who do haptics, say that today's technology is not really there."

One area that sounds tricky is smell, but it might not be as tough as it seems. The biggest attempt to commercialize synthetic scent technology came from DigiScents, a high-profile startup that crashed during the dot-com bust. But the company's co-founder, Joel Bellenson, now CEO of Upstream Biosciences, said that his smell-o-matic technology worked.

"The technological limitations were not the limiting factors for us," Bellenson said. "We had a functional device that was able to make thousands of smells with a scent palette of 64 elements."

He blamed bad timing for his company's ultimate failure.

"Sony had warned us that we would need \$100 million from beginning to end to create a new product category," he said. "We had raised about \$25 million."

The final straw, as the market turned, were the terrorist attacks of Sept. 11.

"We narrowly missed being at the World Trade Center that day. We had accidentally canceled our appointment with Merrill Lynch," he recalled.

"A month or two later, I was looking at our calendar, and saw we were supposed to be there. We said, 'Maybe this is a sign.'"

Although DigiScents' iSmell has entered the history books as a massive failure, earning a spot on PC World's Top 25 Worst Tech Products of All Time, Bellenson says that we should mark up digital scent technology as a missed opportunity, not a failed product.

"If we'd have started the company a year earlier, we would have raised all the money we needed," Bellenson sighed.

In fact, the British researchers see clear paths to most of the technologies they need.

"The sight and sound, we pretty well know how to do that," Howard said. "The smell, we have an idea of how to do it."

Taste, they say, is generated largely through the sense of smell, but they are considering a mouthpiece that could simulate different textures of things that you're chewing on.

Put it all together and they think they can trick the brain into looking around, smelling the orange, feeling the tree's bark, hearing the birds and saying, "I'm in an orchard."

"If you start to join some of the dots with pieces of sensory information," Howard concluded, "The brain will suspend the

belief of where it actually is."

Now all they need is money.